

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) A nonvolatile semiconductor memory device comprising:

(a) a first insulator film formed above a semiconductor substrate;

(b) silicon nitride dots formed on said first insulator film;

(c) a second insulator film formed on said silicon nitride dots;

(d) a conductive film formed on said second insulator film;

(e) first and second semiconductor regions formed in said semiconductor substrate;

(f) a channel region located between said first and second semiconductor regions, wherein

(g) programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion of said channel region on a side of said first semiconductor region or into said silicon nitride dots

on a second end portion of said channel region on a side of said second semiconductor region, and wherein

(h) said first and second insulator films are larger in barrier height than silicon nitride.

2. (Original) The nonvolatile semiconductor memory device according to claim 1, wherein

said first and second semiconductor regions extend in a first direction, and

said conductive film extends in a second direction orthogonal to said first direction.

3. (Cancelled)

4. (Original) The nonvolatile semiconductor memory device according to claim 1, wherein

said first and second insulator films are silicon oxide films.

5. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 1, wherein~~ comprising:

(a) a first insulator film formed above a semiconductor substrate;

(b) silicon nitride dots formed on said first insulator film;

(c) a second insulator film formed on said silicon nitride dots;

(d) a conductive film formed on said second insulator film;

(e) first and second semiconductor regions formed in said semiconductor substrate; and

(f) a channel region located between said first and second semiconductor regions,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion of said channel region on a side of said first semiconductor region or into said silicon nitride dots on a second end portion of said channel region on a side of said second semiconductor region,

said first and second insulator films are larger in barrier height than silicon nitride,

injection of said charges into said silicon nitride dots on said first end portion is conducted by carrying electrons from said second semiconductor region toward said first semiconductor region,

injection of said charges into said silicon nitride dots on said second end portion is conducted by carrying

electrons from said first semiconductor region toward said second semiconductor region,

said charges injected into said silicon nitride dots on said first end portion are determined by carrying the electrons from said first semiconductor region to said second semiconductor region, and

said charges injected into said silicon nitride dots on said second end portion are determined by carrying the electrons from said second semiconductor region to said first semiconductor region.

6. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device according to claim 1, wherein comprising:

(a) a first insulator film formed above a semiconductor substrate;

(b) silicon nitride dots formed on said first insulator film;

(c) a second insulator film formed on said silicon nitride dots;

(d) a conductive film formed on said second insulator film;

(e) first and second semiconductor regions formed in said semiconductor substrate; and

(f) a channel region located between said first and second semiconductor regions,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion of said channel region on a side of said first semiconductor region or into said silicon nitride dots on a second end portion of said channel region on a side of said second semiconductor region,

said first and second insulator films are larger in barrier height than silicon nitride, and

said silicon nitride dots are $\text{Si}_x\text{N}_{1-x}$, where $0 < x < 1$.

7. (Previously Presented) The nonvolatile semiconductor memory device according to claim 6, wherein the X in said $\text{Si}_x\text{N}_{1-x}$ is approximately 0.43.

8. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 1, wherein~~ comprising:

(a) a first insulator film formed above a semiconductor substrate;

(b) silicon nitride dots formed on said first insulator film;

(c) a second insulator film formed on said silicon nitride dots;

(d) a conductive film formed on said second insulator film;

(e) first and second semiconductor regions formed in said semiconductor substrate; and

(f) a channel region located between said first and second semiconductor regions,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion of said channel region on a side of said first semiconductor region or into said silicon nitride dots on a second end portion of said channel region on a side of said second semiconductor region,

said first and second insulator films are larger in barrier height than silicon nitride, and

a surface portion of said silicon nitride dots is higher in nitrogen concentration than a central portion of said silicon nitride dots.

9. (Original) The nonvolatile semiconductor memory device according to claim 1, wherein

said silicon nitride dots are present as a single layer on said first insulator film.

10. (Previously Presented) A nonvolatile semiconductor memory device comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first silicon oxide film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film, wherein

(i) programming is performed by injecting charges from said channel region into said silicon nitride dots on an end portion of said channel region on a side of said second semiconductor region, and wherein

(j) said first and second silicon oxide films are larger in barrier height than silicon nitride.

11. (Original) The nonvolatile semiconductor memory device according to claim 10, wherein

said first and second semiconductor regions extend in a first direction,

said first conductive film extends in a second direction orthogonal to said first direction, and

said second conductive film extends in said first direction.

12. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 10,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first silicon oxide film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on an end portion of said channel region on a side of said second semiconductor region,

(j) said first and second silicon oxide films are larger in barrier height than silicon nitride, and

said first and second silicon oxide films are Si_xO_2 , where $x \leq 1$.

13. (Original) The nonvolatile semiconductor memory device according to claim 10, wherein

said first silicon oxide film is a thermal oxide film, and said second silicon oxide film is a deposited film.

14. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 10,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first silicon oxide film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on

an end portion of said channel region on a side of said
second semiconductor region,

said first and second silicon oxide films are larger in
barrier height than silicon nitride,

injection of said charges into said silicon nitride
dots is conducted by carrying electrons from said second
semiconductor region toward said first semiconductor region,
and

said charges injected into said silicon nitride dots
are determined by carrying the electrons from said first
semiconductor region to said second semiconductor region.

15. (Currently Amended) ~~The~~ A nonvolatile
semiconductor memory device ~~according to claim 10,~~
wherein comprising:

(a) first and second semiconductor regions formed in a
semiconductor substrate;

(b) a channel region located between said first and
second semiconductor regions;

(c) a first silicon oxide film formed above said
semiconductor substrate, and extending from above said
channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon
oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on an end portion of said channel region on a side of said second semiconductor region,

said first and second silicon oxide films are larger in barrier height than silicon nitride, and

said silicon nitride dots are $\text{Si}_x\text{N}_{1-x}$, where $0 < x < 1$.

16. (Previously Presented) The nonvolatile semiconductor memory device according to claim 15, wherein the X in said $\text{Si}_x\text{N}_{1-x}$ is approximately 0.43.

17. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 10,~~
wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first silicon oxide film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film,

Wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on an end portion of said channel region on a side of said second semiconductor region,

said first and second silicon oxide films are larger in barrier height than silicon nitride, and

a surface portion of said silicon nitride dots is higher in nitrogen concentration than a central portion of said silicon nitride dots.

18. (Original) The nonvolatile semiconductor memory device according to claim 10, wherein

said silicon nitride dots are present as a single layer on said first silicon oxide film.

19. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 10,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first silicon oxide film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) silicon nitride dots formed on said first silicon oxide film;

(e) a second silicon oxide film formed on said silicon nitride dots;

(f) a first conductive film formed on said second silicon oxide film;

(g) an insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region; and

(h) a second conductive film formed on said insulator film,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on an end portion of said channel region on a side of said second semiconductor region,

said first and second silicon oxide films are larger in barrier height than silicon nitride,

said first and second semiconductor regions and said first and second conductive films extend in a same direction, and

said second conductive film extends to be mounting up above said first conductive film.

20. (Previously Presented) A nonvolatile semiconductor memory device comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) a first conductive film formed on said first insulator film;

(e) a second insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region;

(f) a second conductive film formed on said second insulator film;

(g) a third insulator film formed above the semiconductor substrate between said first and second conductive films;

(h) silicon nitride dots formed on said third insulator film;

(i) a fourth insulator film formed on said silicon nitride dots; and

(j) a third conductive film formed on said silicon nitride dots, wherein

(k) programming is performed by injecting charges from said channel region into said silicon nitride dots on a

first end portion on a side of said first conductive film or into said silicon nitride dots on a second end portion on a side of said second conductive film, and wherein

(1) said third and fourth insulator films are larger in barrier height than silicon nitride.

21. (Original) The nonvolatile semiconductor memory device according to claim 20, wherein

said first and second semiconductor regions extend in a first direction,

said first and second conductive films extend in said first direction, and

said third conductive film extends in a second direction orthogonal to said first direction.

22. (Cancelled)

23. (Original) The nonvolatile semiconductor memory device according to claim 20, wherein

said third and fourth insulator films are silicon oxide films.

24. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 20,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) a first conductive film formed on said first insulator film;

(e) a second insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region;

(f) a second conductive film formed on said second insulator film;

(g) a third insulator film formed above the semiconductor substrate between said first and second conductive films;

(h) silicon nitride dots formed on said third insulator film;

(i) a fourth insulator film formed on said silicon nitride dots; and

(j) a third conductive film formed on said silicon nitride dots,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion on a side of said first conductive film or into said silicon nitride dots on a second end portion on a side of said second conductive film,

said third and fourth insulator films are larger in barrier height than silicon nitride,

injection of said charges into said silicon nitride dots on said first end portion is conducted by carrying electrons from said first semiconductor region toward said second semiconductor region,

injection of said charges into said silicon nitride dots on said second end portion is conducted by carrying electrons from said second semiconductor region toward said first semiconductor region,

said charges injected into said silicon nitride dots on said first end portion are determined by carrying the electrons from said second semiconductor region to said first semiconductor region, and

said charges injected into said silicon nitride dots on said second end portion are determined by carrying the electrons from said first semiconductor region to said second semiconductor region.

25. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 20,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) a first conductive film formed on said first insulator film;

(e) a second insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region;

(f) a second conductive film formed on said second insulator film;

(g) a third insulator film formed above the semiconductor substrate between said first and second conductive films;

(h) silicon nitride dots formed on said third insulator film;

(i) a fourth insulator film formed on said silicon nitride dots; and

(j) a third conductive film formed on said silicon nitride dots,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion on a side of said first conductive film or into said silicon nitride dots on a second end portion on a side of said second conductive film,

said third and fourth insulator films are larger in barrier height than silicon nitride, and

said silicon nitride dots are $\text{Si}_x\text{N}_{1-x}$, where $0 < x < 1$.

26. (Previously Presented) The nonvolatile semiconductor memory device according to claim 25, wherein the X in said $\text{Si}_x\text{N}_{1-x}$ is approximately 0.43.

27. (Currently Amended) ~~The~~ A nonvolatile semiconductor memory device ~~according to claim 20,~~ wherein comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said first semiconductor region;

(d) a first conductive film formed on said first insulator film;

(e) a second insulator film formed above said semiconductor substrate, and extending from above said channel region toward above said second semiconductor region;

(f) a second conductive film formed on said second insulator film;

(g) a third insulator film formed above the semiconductor substrate between said first and second conductive films;

(h) silicon nitride dots formed on said third insulator film;

(i) a fourth insulator film formed on said silicon nitride dots; and

(j) a third conductive film formed on said silicon nitride dots,

wherein programming is performed by injecting charges from said channel region into said silicon nitride dots on a first end portion on a side of said first conductive film or into said silicon nitride dots on a second end portion on a side of said second conductive film,

said third and fourth insulator films are larger in barrier height than silicon nitride, and

a surface portion of said silicon nitride dots is higher in nitrogen concentration than a central portion of said silicon nitride dots.

28. (Original) The nonvolatile semiconductor memory device according to claim 20, wherein

said silicon nitride dots are present as a single layer on said third insulator film.

29. (Previously Presented) A nonvolatile semiconductor memory device comprising:

(a) first and second semiconductor regions formed in a semiconductor substrate;

(b) a channel region located between said first and second semiconductor regions;

(c) a first insulator film formed above said semiconductor substrate on said channel region;

(d) a first conductive film formed on said first insulator film;

(e) a second insulator film formed above said semiconductor substrate on both sides of said first conductive film;

(f) silicon nitride dots formed on said second insulator film;

(g) a third insulator film formed on said silicon nitride dots; and

(h) a second conductive film formed on said third insulator film, wherein

(i) programming is performed by injecting charges into said silicon nitride dots adjacent to the both sides of said first conductive film, respectively, and wherein

said second and third insulator films are larger in barrier height than the silicon nitride.

Claims 30-41 (canceled)

42. (New) The nonvolatile semiconductor memory device according to claim 29, wherein

said silicon nitride dots are $\text{Si}_x\text{N}_{1-x}$, where $0 < x < 1$.

43. (New) The nonvolatile semiconductor memory device according to claim 42, wherein

the x in said $\text{Si}_x\text{N}_{1-x}$ is approximately 0.43.

44. (New) The nonvolatile semiconductor memory device according to claim 29, wherein

a surface portion of said silicon nitride dots is higher in nitrogen concentration than a central portion of said silicon nitride dots.

45. (New) The nonvolatile semiconductor memory device according to claim 29, wherein

said silicon nitride dots are present as a single layer on said first insulator film.